

Analysis of Great Lakes Ice Cover Using RADARSAT SAR Data

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During winter months, cloud cover over the Laurentian Great Lakes impairs the use of satellite imagery from passive sensors operating in the visible, near infrared, and thermal infrared spectra for ice cover monitoring and analysis. The all-weather, day/night viewing capability of satellite Synthetic Aperture Radar (SAR) makes it a unique and valuable tool for Great Lakes ice identification and mapping providing that data analysis techniques and capability for using SAR data in an operational setting are developed. RADARSAT, an operational satellite carrying a SAR operating at 5.3 GHz (C-Band) with a horizontal polarization, was successfully launched in 1995. This study explores algorithms for Great Lakes ice cover classification and mapping using RADARSAT SAR data.

Preliminary computer analysis of a ScanSAR Narrow image of western Lake Superior using a supervised (level slicing) classification technique indicate that different ice types in the ice cover can be identified and mapped and that wind speed and direction can have a strong influence on the backscatter from open water. During 1997 winter season, shipborne polarimetric backscatter data using the Jet Propulsion Laboratory (JPL) C-band scatterometer, together with surface-based ice physical characterization measurements and environmental parameters were acquired concurrently with RADARSAT overpass. This data set was processed to radar cross-section and will establish a library of signatures (look-up table) for different ice types to be used in the machine classification of calibrated satellite SAR data.